

Before the
Federal Communications Commission
Washington DC 20554

In the Matter of)

Aviat Networks, Request for Waive of)
Certain Antenna Requirements in the)
71-76 and 81-86 GHz Bands)

WT Docket No. 15-244

COMMENTS ON 15-244

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INTRODUCTION

Dash Networks Corporation strongly opposes any action by the Commission to grant a waiver to Aviat Networks to use smaller antennas in the 71-76 and 81-86 GHz bands and recommends that Aviat instead should request a waiver for a smaller antenna for use in the 92-95 GHz band.

Dash Networks Corporation is a company focusing on the manufacture and telecom services primarily utilizing the 71-76 and 81-86 GHz bands. Dash Networks has already proven and is currently developing very high bandwidth wireless communications in the 71-76 GHz and 81-86 GHz bands.

As background, the CEO of Dash Networks Corporation, Louis Slaughter, was previously CEO of Loea Communications Corporation and the principal person responsible for the first commercial communications in and the original petition filed for rule making in the 71-76 and 81-86 GHz bands (RM-10288). Our CTO, Douglas Lockie, also had significant involvement in the rule making having participated in many meetings with our CEO including with the wireless manufacturing community on antenna sizes and side lobe power characteristics, organized by the Wireless Communications Association, Committee for 60 GHz and above, of which Douglas Lockie was the Chairperson.

As a result of all the meetings and hard work by our CEO, CTO, industry experts and members of the Commission, extensive review and deliberations by the Commission, including almost 100 filings including the comments to the Loea filing (WT Docket No. 02-146) the Commission wisely ruled on the matter including the current rules for antenna sizes and power output.

One of the fundamental arguments made in the Loea Petition, was that by using the antenna specifications agreed to by the industry at the time and as proposed; "the unique nature of the propagation characteristics of the Upper Millimeter Wave bands, which originate as directional pencil-size beams, multiple services and applications can be implemented without interference concerns, obviating the need to authorize this spectrum on the basis of scarcity".

The Commission is to be commended on the current rules that exist for the 71-76 and 81-86 GHZ bands. Dash Networks believes that these bands are unique and important and, antenna sizes should not be reduced because these two blocks of spectrum are the last remaining large blocks of frequency to support the next generation of IP Metro Transport, over significant distances in a metro area, referred to by our CEO in the Loea Petition as "Virtual Fiber". Any waiver granted for reducing the antenna size, Dash Networks believes, will have a negative effect on the utility of these bands to address the huge demand for video and data transport throughout a metro area.

Dash Networks believes that smaller antennas with 71-76 and 81-86 GHZ bands radios with reduced sideline performance and wider beam widths are only suitable for lower data rates. This will ultimately lead to higher levels of channelization to obtain interference free operation. Such an outcome will destroy the uniqueness and potential utility of the large blocks of frequency spectrum in the 71-76 and 81-86 GHZ bands.

Dash Networks believes that granting of the waiver requested by Aviat would be premature and akin to polluting the metro areas by setting a precedent that would be difficult to unwind. At the very least, prior to any granting of a waiver, a significant amount of study should be undertaken to understand the rapid changes in broadband demand and changes in

technology, not just in antennas, but also in Monolithic Microwave Integrated Circuits (MMIC's) and other radio technologies to understand the overall demand and impact by new technology on communications within the 71-76 and 81-86 GHz bands. Only then should the Commission make a decision on the best use of the bands vis-a-vis any waivers or amendments to be granted.

DISCUSSION

The following discussion is presented because Dash Networks believes that it is important to understand the potential and overarching utility of the 71-76 and 81-86 GHz bands and their value to the future of telecommunications and this country.

THE UTILITY OF THE 71-76 AND 81-86 GHZ SPECTRUM

The 71-76 and 81-86 GHz bands are ideal for communications at very high bandwidth and at significant distances in metro areas. The bands have been set aside in two very large blocks as agreed at the World Radio Telecommunications Conference (WRC) which coordinates international treaties on radio frequency.

The RWC representatives, including scientists representing the international community, Dash Networks believes, decided on the utility of these bands realizing that even though the technology was yet to be developed to fully utilize these bands, the bands would one day have a significant and important impact on global telecommunications.

The 71-76 and 81-86 GHz bands are ideal and important for long distance communications in a metro area (a mile versus a few hundred yards) because they are the lowest available very large blocks of commercial frequency spectrum and fall within a significant "trough" thus minimizing the atmospheric affects of weather. See Figure 1 below:

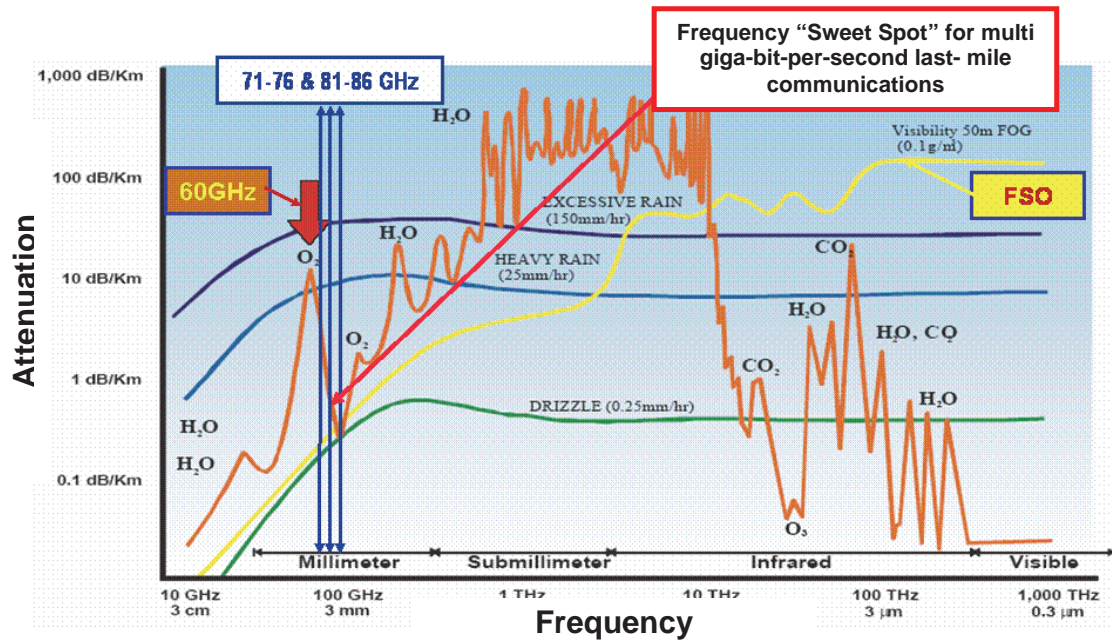


FIGURE 1

TECHNOLOGY CONTINUES TO IMPROVE WITH A POSITIVE IMPACT ON PERFORMANCE AND THE UTILITY OF THE 71-76 AND 81-86 GHZ BANDS

At the time of the Commission's rule making, the power available for use in the 71-76 and 81-86 GHz bands radio hardware in the form of MMIC chipsets, using Gallium Arsenide (GaN), and power combining techniques, limited the effective distance of communications within the 71-76 and 81-86 GHz bands through heavy rain such that distances at continuous full throughput capacity (at the time 1 Gbps) was less than half a mile. Accordingly, claims of 99.999% or 99.99% (five nines and four nines respectively) performance previously could not be made at any reasonable distance to enable continuous high bandwidth communications at long distances (one mile) in metro areas in the 71-76 and 81-86 GHz bands. To be considered as "virtual fiber" and as a real alternative to fiber, it was, and is, important to increase distance of communications at full throughput through heavy rain. Previously and even today, radio manufacturers in these same bands claim high availability performance to several miles but,

they achieve this claim by using adaptive power whereby the actual throughput of data is significantly degraded when heavy rain occurs. So in reality, the claim of high availability at very high speed, "virtual fiber", has not been possible and so improvement in technology was required.

The technology is now available and proven with advanced MMIC chipsets and other technologies to enable very high speed communications (at speeds greater than 10 Gbps) at 99.999% availability and at distances up to a mile for a large portion of the United States. Achieving distances of longer than a mile through heavy rain will only be incremental as technology advances due to physics whereby a logarithmic increase in transmit power is required for a corresponding linear increase in distance. But a mile distance at very large bandwidth and high availability is ideal for metro areas and cities throughout the USA.

THE IMPORTANCE OF "PENCIL BEAMS" AND THE NEED FOR MAINTAINING STRINGENT ANTENNA SPECIFICATIONS

Very tight wireless beams or "pencil beams" enable a significant number of wireless links to be installed within a single metro area and limit the potential for interference. The "pencil beam" enables the installation of more communications links than could be installed with broader beams from smaller antennas. And, as important, within these "pencil beams" each wireless link is able to utilize both of the large blocks of the 71-76 and 81-86 GHz bands to enable very large transfers of video and data.

At the time of the filing by our CEO of the Loea Petition, the Commission in discussions with our CEO, was considering cognitive or smart radios to effectively enable the reuse of scarce frequency. The case presented by our CEO was that "reuse" of the frequency within the 71-76 and 81-86 GHz bands was not necessary as the frequency could be effectively used due

to the concept of "pencil beams". It was in effect achieving the same outcome sought by the Commission but instead of using smart radios. In order to achieve "pencil beams" and given the nature of the physics of 71-76 and 81-86 GHz Millimeter Wave bands the decision on the specifications of the antennas, which in turn impacted the size of the beams, was critical.

The broad adoption and the future utility of the 71-76 and 81-86 GHz bands is a direct function of regulations providing for the tightest possible beam size that technology can support. Dash Networks believes that any reduction of antenna sizes and consequent increase in beam size is contrary to the utility of the spectrum and not in the best interests of the American public.

Any reduction in antenna sizes must ultimately impact the number of wireless links using the 71-76 and 81-86 GHz bands that may be deployed in any metro area. Below in Figure 2 shows the efficiency of frequency use by the 71-76 and 81-86 GHz bands with "pencil beams" as compared to Microwave frequency at a distance of a mile.

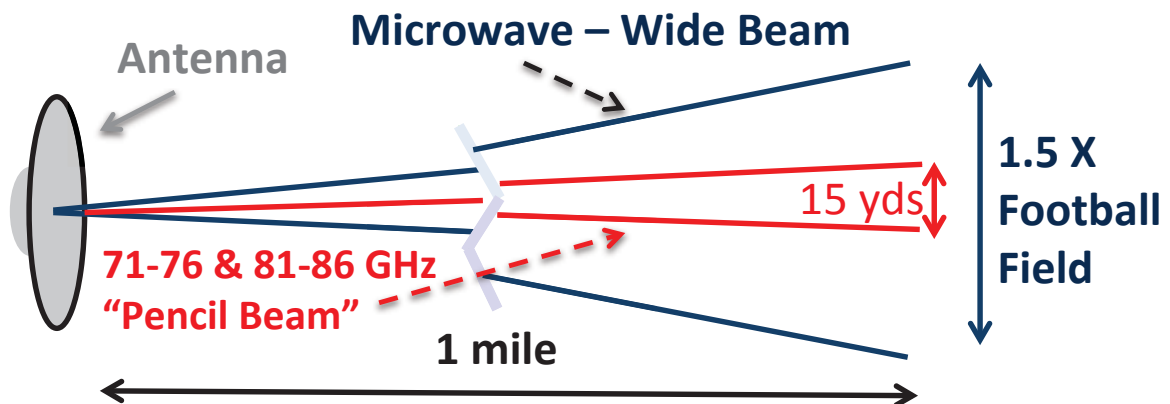


FIGURE 2

In a dense metro area Dash Networks projects that there will be a large number of 71-76 and 81-86 GHz wireless links deployed and any decrease in antenna size of other users, leading to wider beams, would prevent the effective utilization of the 71-76 and 81-86 GHz bands. See the example below in Figure 3 where a number of connections between buildings is shown. If smaller antennas were to be allowed by the Commission, some number of connections or circuits would not be possible as shown in Figure 3.

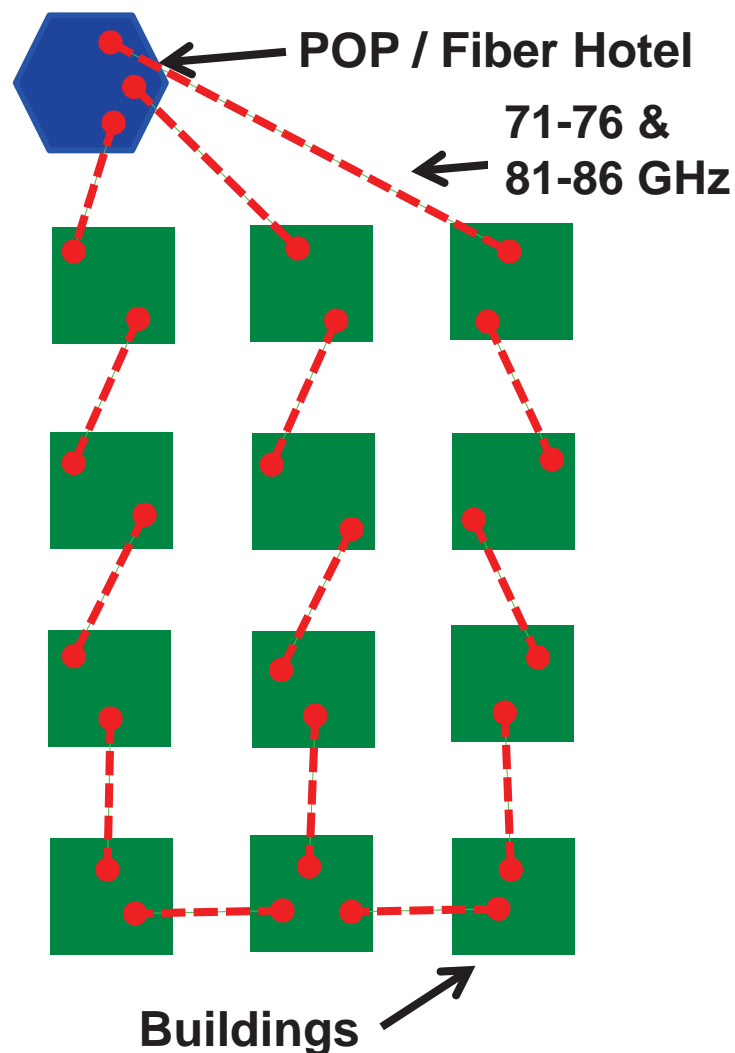


FIGURE 3

THE APPLICATION OF 71-76 AND 81-86 GHz BANDS IN THE FUTURE

The applications of these two very large blocks of frequency spectrum along with the next generation of MMIC chipsets that are now available, or being developed, and recent developments in technology will for the first time in history enable metro rings with spokes or mesh networks over metro areas and cities. To date, wireless communications has only been used for the following network configurations:

- i) point-to-multipoint links, similar to that used for cellular communications or
- ii) multiple point-to-point links off a single lit building (a "star pattern" connected to a fiber point).

(Dash believes the waiver requested by Aviat will most likely be similar to the second ("ii") method of deployment of wireless but with a nominal increase in data throughput and over short distances.)

True metro area rings, offering consistent very high data rate over a mile distance, competitive with or complementary with fiber, with spokes of slower speed wireless links was not possible with previous wireless technologies and with limited sized blocks of frequency spectrum as compared to the potential opportunity with the large blocks of 71-76 and 81-86 GHz bands. True "virtual fiber" to create rings is now a reality and it is of paramount importance that the paradigm of "pencil beams" be maintained by the Commission.

In figure 4 below is a depiction of a "virtual fiber" ring around a metro area by daisy-chaining very high speed point-to-point wireless. For this "virtual fiber" ring to be created it is important that "pencil beams" are deployed to enable the creation of the links by efficiently using the 71-76 and 81-86 GHz bands and that there be minimum interference which could

prevent even just one of the links from not being deployed to create the ring and thereby facilitating resiliency (similar to resilient SONET fiber rings in the 1990's). By decreasing antenna sizes for a short link to satisfy a niche market, Dash Networks believes this will increase the probability of interference, with even just one link, which would jeopardize the creation of a daisy-chain of links to create a metro area ring.

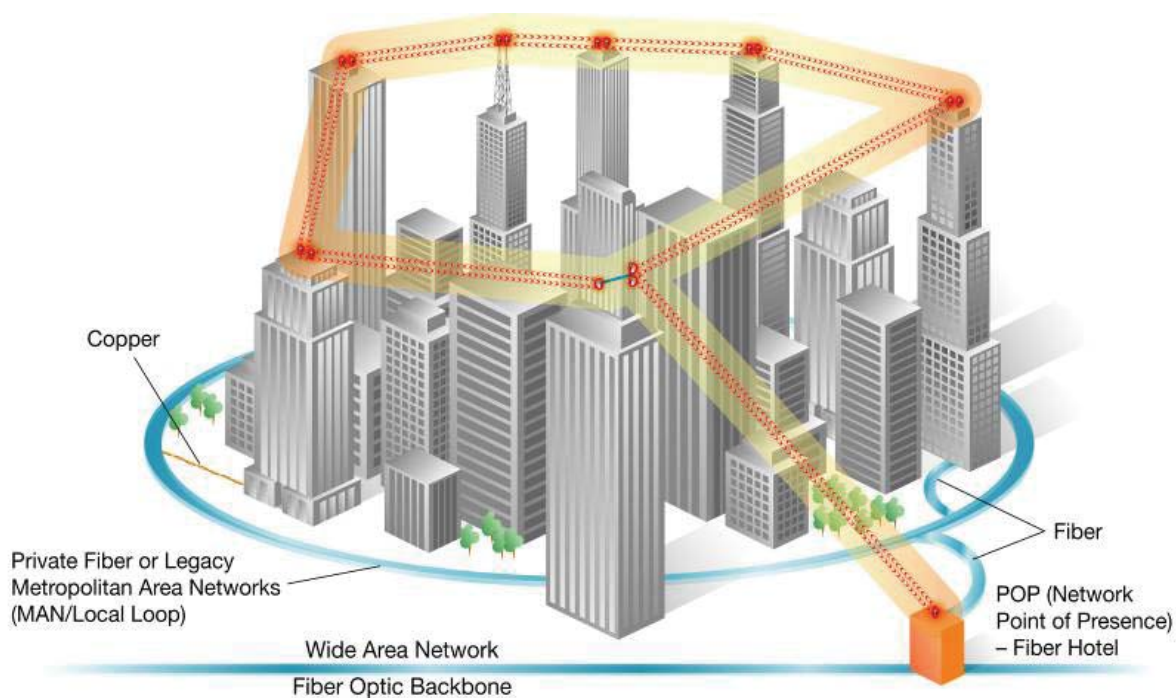


FIGURE 4

To further make the case of the importance of creating rings, below in Figure 5 is an example of a plan developed by Dash Networks to connect all of the New York City Housing Authority buildings using wireless. It has been reported that 60% of 420,000 persons living in New York Housing Authority buildings do not have access to affordable internet in their homes. (Connection to the internet is a function of availability and cost. Fiber may be

ubiquitously deployed but because of the investment required to trench fiber, the ultimate price to the end user for access to the cloud, to justify a return on investment in fiber, may prohibit the users from subscribing to connect to the internet.) Dash Networks' plan involves building a primary ring with very high speed wireless by daisy-chaining 71-76 and 81-86 GHz bands wireless links through four boroughs of New York city connected to just one fiber hotel on Manhattan island. Any interference of just one of the links as a result of the Commission enabling small antennas could, as proposed in this example, jeopardize the creation of the primary ring. Such a primary high speed wireless ring could be created at a significant fraction of the cost to lay fiber, potentially as low as 1/50th of the cost to trench fiber, to provide similar high availability broadband capability.

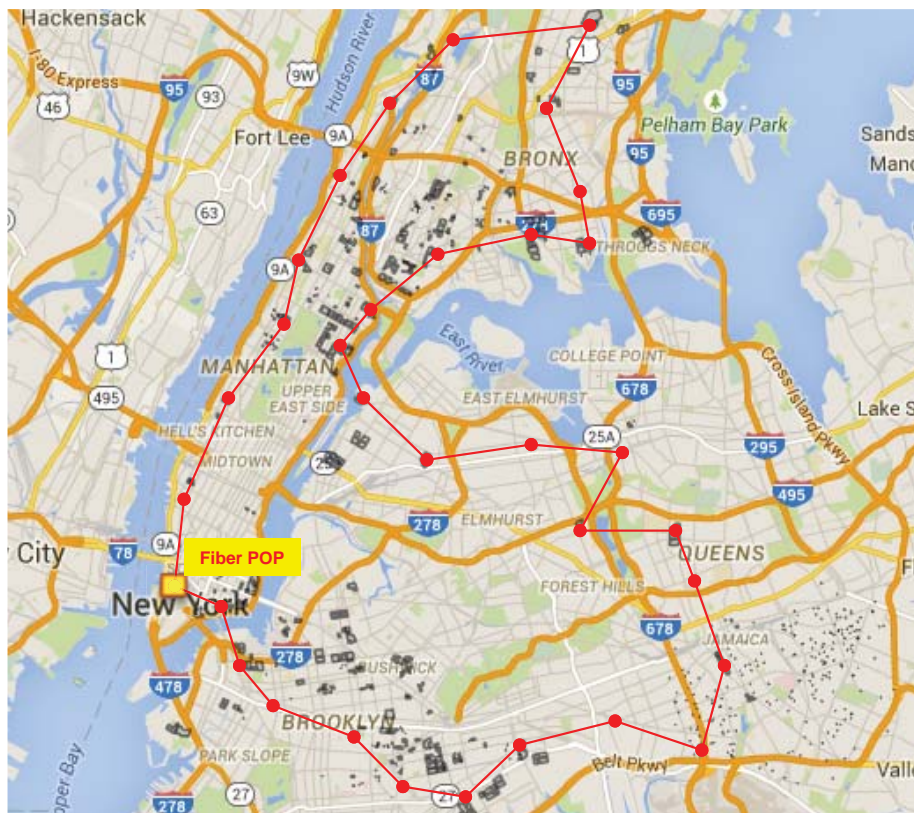


FIGURE 5

In Figure 6 below is an example of how all the New York City Housing Authority buildings could be wirelessly connected in Brooklyn, New York, by using spokes off the primary ring and by using other frequencies including 92 to 95 GHz. Dash Networks believes that the 92 to 95 GHz bands and other frequencies are more appropriate for short links at reasonable data rates of multi gigabits-per-second.

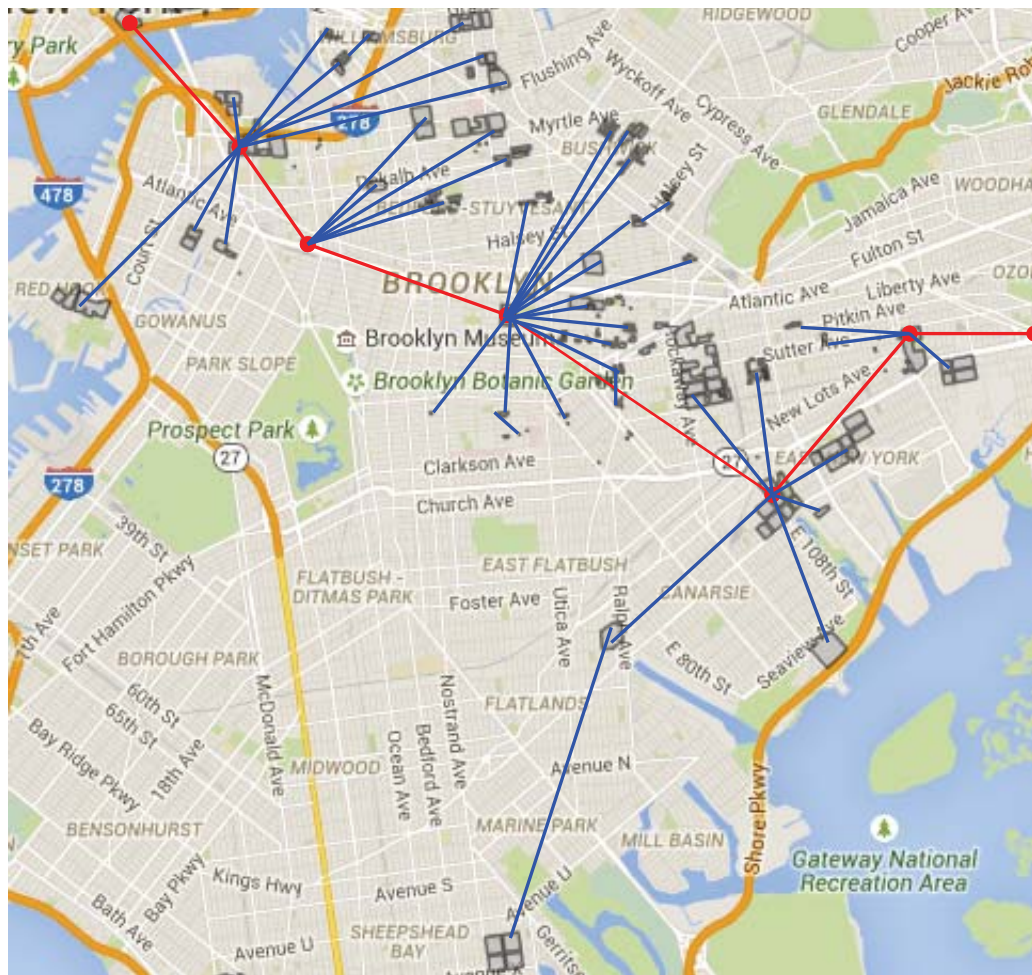


FIGURE 6

An important aspect of network developments is the exploding growth of Wi-Fi networks. Cisco predicts that by 2018 more than half wireless cellular traffic will be offloaded to Wi-Fi. Accordingly, Dash Networks believes that metro areas of the future will require

ubiquitous deployment of fiber equivalent speed networks to support such Wi-Fi deployment (in addition to cell sites as referenced by Aviat in their request for Waiver). Today, a handful of access points for Wi-Fi, fully utilized or loaded, require backhaul of greater than 1 Gbps capacity. To support this backhaul demand by deploying ubiquitous fiber across metro areas, especially in tier two and tier three cities is very expensive, uneconomical and will not be a reality. Dash Networks believes that to be able to aggregate and backhaul large numbers of Wi-Fi access points and cell sites across a metro area, it is critical to be able to deploy radios using the 71-76 and 81-86 GHz bands to provide rings with spokes or mesh networks. The plan to address the aggregated backhaul of ubiquitous coverage across a metro area of Wi-Fi and cell deployments is akin to building a highway system. The 71-76 and 81-86 GHz bands would serve as the freeways or highways feeding the "off-ramps" and "side streets" which would be served by other frequency bands such as 92-95 GHz and even higher frequency bands above 100 GHz. The Commission may wisely authorize frequencies above 100 GHz at some point in the future. There is significant spectrum above 100 GHz, not including optical and ideal for short haul distances for high availability communications.

THE CONSEQUENCE (INCLUDING THE UNINTENDED CONSEQUENCE) OF REDUCING THE SIZE OF ANTENNAS

Dash Networks believes that by allowing Aviat's request for a waiver, the Commission will increase the potential for interference between beams thereby reducing the number of deployments of radios using the 71-76 and 81-86 GHz bands in any metro area and the utility of the bands to create rings with spokes or mesh networks.

Dash Networks also believes that smaller antennas with the 71-76 and 81-86 GHz band radios with reduced sideline performance and wider beam widths, thus abandoning the

concept of a "pencil beam", are only suitable for lower data rates. This is a "slippery slope" leading to an unwanted precedent. This will ultimately lead to higher levels of channelization of the bands to obtain interference free operation. Such an outcome will destroy the uniqueness and potential utility of the 71-76 and 81-86 GHz bands with the current large blocks of frequency spectrum.

There is also an unintended consequence resulting from approval of the request by Aviat of a waiver that will contribute to increased interference. Equipment manufacturers will be empowered to produce radios with smaller antennas that will result in certain purchasers of the hardware deploying wireless links without registering and obtaining licenses for the wireless links. Dash Networks believes there are already a number of links deployed in metro areas using the 71-76 and 81-86 GHz bands that are operating without licenses. If equipment with smaller antennas is not authorized for deployment, they will not be available for sale and the chance of illegal interference is further limited.

AVIAT NETWORKS REQUEST FOR WAIVER

Aviat correctly claims the following:

- "Predicting future developments in technology is notoriously difficult".
- "The Commission expected these bands would be a substitute for fiber optic cable"
- "Costs have dropped".
- "The increasing density of sites that serve public networks is changing the nature of "Backhaul" connections.....Backhaul distances are declining from kilometers to a few hundred meters".
- "Since 2005, there have been only about 5,500 registered links at 71-76/81-86 /92095 GHz".

Dash Networks, whilst agreeing with the aforesaid correct statements by Aviat, believes there are other important considerations that should be taken into account by the Commission and respectfully has the following comments:

Dash Networks agrees that predicting technology developments is difficult, but further believes that the industry is on the cusp of technology innovation that will enable huge amounts of data transfer using 71-76 and 81-86 GHz bands which will serve as the next generation of metro IP transport, not just as backhaul from single cell sites, but to serve as backhaul from multiple cell sites and Wi-Fi access points back to even a single Point-of-Presence in a metro area. Dash Networks, with its strategic partners, has already demonstrated the viability of very large capacity transport using the 71-76 and 81-86 GHz bands. Because of the potential for very large amounts of backhaul that is now possible with evolving technology, it is paramount that priority be given to maintaining "pencil beams" over

reducing the size of antennas to solve a local area backhaul problem over just a few hundred meters.

Our CEO, in the original Loea Petition, along with our CTO believed at the time, and the Commission was persuaded, that the 71-76 and 81-86 GHz bands can be a substitute for fiber and also be complementary to fiber. Now that reality has been realized and Dash Networks is convinced that the 71-76 and 81-86 GHz bands can enable "virtual fiber" and give more public access to the cloud and at a more affordable price. Providing very-high-speed bandwidth to the public will ultimately be solved by a combination of technologies that will include fiber, fiber plus wireless and wireless alone. It is important that the Commission does not set any precedents to jeopardize this solution to the nations appetite for increasing affordable broadband.

The fact that costs have dropped will enable less costly access to the IP cloud for the American population. This paradigm of a continuing drop in cost that Aviat refers to is impacting all aspects of wireless and not just access for their niche market of cell backhaul over a few hundred meters. Dash Networks believes that the 71-76 and 81-86 GHz bands will enable cost effective IP transport across metro areas by daisy-chaining wireless links. It will ultimately lower the cost of internet access to the underserved in our nation as demonstrated in the above example for serving the New York City Housing Authority buildings.

Aviat claims "Backhaul distances are declining from kilometers to a few hundred meters". While Dash Networks believes this statement is correct, it is also myopic to focus on backhaul of a few hundred meters to serve Micro and Pico cells which are part of the new network architecture for cell backhaul. What is not addressed is that the overall backhaul across a metro area, specially in the tier two and tier three cities, is becoming exacerbated

because all of the small cells now must be aggregated and backhauled across a metro area and there is not enough fiber or fiber is not ubiquitously deployed across a metro area to aggregate all the points of backhaul demand, including the backhaul from each of the small cells referred to by Aviat in its request for a waiver.

There have been only about 5,500 registered links at 71-76/81-86/92-95 GHz according to Aviat. Dash Networks believes that this phenomenon has been the result of the delay in the explosion of data demand compounded by the large increase in mobile users that has only occurred in recent years. The first evident pain point of this data demand and mobility of users is the build out of smaller cell sites such as Micro and Pico cells to effectively reuse the limited amount of spectrum owned by the mobile carrier community. Dash Networks believes that other pain points will soon follow to interconnect and transport video and data across metro areas. Dash Networks recommends that the Commission does not rush to judgment to address this first pain point and jeopardize the concept of "pencil beams" by granting a waiver to Aviat.

At the time of the Loea petition by our CEO, broadband demand was limited, even mobile broadband demand was not rapidly growing. At the time of filing of the petition, most businesses were using T1 lines and a 1 Gbps connection was not typical, even for a business. Also contributing to the small amount of registrations was the cost of 71-76 and 81-86 GHz bands wireless links with a 1 Gbps wireless link costing more than \$25,000. Today, the price for a 1 Gbps wireless link in the 71-76 and 81-86 GHz bands is less than \$6,000. Finally, the technology had not evolved to enable communications up to a mile for most of the United States at 99.99% or 99.999% uptime. It is now possible to purchase a very high bandwidth "virtual fiber" wireless link for high availability up to a mile at a cost of less than \$20,000 per

wireless link versus one example in which it costs up to \$200 per foot, plus \$30 per foot for a permit, in the city of Boston to trench and lay fiber. Dash Networks believes that for the reasons stated above, the number of registrations in the 71-76 and 81-86 GHz bands to date have been low but will increase in the future.

A VIABLE ALTERNATIVE FOR AVIAT

As outlined above, the 71-76 and 81-86 GHz bands are ideal for IP transport across a metro area of very large amounts of video and data utilizing rings with spokes or mesh networks rather than backhaul of just several gigabits-per-second from small cell sites over a few hundred meters. Accordingly, for small cell site backhaul, using sophisticated quadrature amplitude modulation (QAM) schemes and just a few gigahertz of bandwidth should suffice.

Dash Networks recommends to the Commission that it advise Aviat to reconsider filing for the antenna waiver in the 92-95 GHz band that can easily handle the backhaul of cell sites of a few gigabits-per-second over a few hundred meters.

CONCLUSION

Dash Networks strongly believes that the existing rules for the 71-76 and 81-86 GHz bands as ordered by the Commission are ideal for the effective utilization of the bands. The Commission promulgated these rules after significant deliberation by the industry and regulators. Only now will we begin to realize the full benefit of these rules.

Any reduction in antenna sizes, Dash Networks believes, will jeopardize the true future utility of the 71-76 and 81-86 GHz bands and the 10 GHz of frequency spectrum therein to transfer very large amounts of video and data across metro areas.

For Aviat's application to transport just a few gigabits-per-second over a few hundred meters, Aviat should consider requesting a waiver for a smaller antenna in the 92-95 Gigahertz band.

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